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## Reducing the Discount Rate

Ben L. Trachtenberg

*University of Missouri School of Law*, [trachtenbergb@missouri.edu](mailto:trachtenbergb@missouri.edu)

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## **Reducing the Discount Rate**

**Ben Trachtenberg**

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# Reducing the Discount Rate

*Combining the effects of health care inflation and wealth-adjusted willingness to pay for future benefits, the undervaluation of lives saved decades from now via current cost-benefit analysis becomes especially stark*



Associate Professor **Ben Trachtenberg** teaches at University of Missouri School of Law.

**U**nderregulation kills. When a sensible and effective rule is proposed but then not implemented, society loses whatever benefits the regulation would have provided. When those benefits take the form of saved lives — if, for example, the rule would have kept a carcinogen out of the workplace — failing to enact and enforce a regulation means people die. Unfortunately, federal agencies in the United States systematically undercount the benefits of rule-making, causing regulators to forsake the implementation of lifesaving measures that would have been enacted were benefits estimated more accurately. The result is American lives lost, every year.

This article presents two arguments against the “discounting” of future human lives as part of cost-benefit analysis, or CBA. Discounting works like compound interest in reverse to reduce benefits achieved in the future to their present value, where they can be compared to present costs, since (it is assumed) future benefits are worth less today. Naturally the discount rate (percentage interest rate) employed affects this outcome, but the point is that the rates used by agencies today systematically undercount benefits. Absent ethical objections to the disparate treatment of present and future humanity, the economic calculations of CBA itself — if properly performed — counsel against discounting lives. In other words, even if society sets aside all moral concerns with the discounting of future generations in principle, the current practice of discounting future hu-

man lives cannot be justified even on the discounters’ own economic terms.

Our first argument is that because CBA has thus far ignored evidence of rising health care expenditures, it underestimates the “willingness to pay” for health and safety that future citizens will likely exhibit, thereby undervaluing their lives. Our second argument is that until recently CBA has ignored the trend of improved material conditions in developed countries, and most agencies continue to ignore it entirely. As time advances, residents of rich countries tend to live better and spend more, meaning that a strict economic evaluation of future lives would discount the relatively impoverished lives of present citizens compared to the projected luxurious and healthy existence of our expected descendants, just the opposite of what happens in agency practice.

Because all federal regulatory agencies calculate costs and benefits, the underregulation resulting from improper discounting deprives Americans of benefits in several diverse ways. By undercounting the benefits of environmental protection, the Environmental Protection Agency deprives Americans of clean air and clean water. By undercounting the benefits of workplace safety, the Occupational Safety and Health Administration exposes Americans to health hazards. By undercounting the benefits of automobile accident prevention, the National Highway Traffic Safety Administration increases the number of fatal crashes. Examples are limited only by the number of federal agencies and the scope of their regula-





tory mandate. Regulations concerning global climate change, the benefits of which would be realized far into the future, are especially impeded by overdiscounting. Until regulators correct their method for discounting the benefits of saving human lives in the future, the United States will continue to suffer the fatal costs of underregulation, and agencies will remain in violation of legal requirements to maximize net benefits.

**W**hen deciding whether and how to regulate, federal agencies evaluate the costs and benefits of proposed regulatory strategies, comparing one strategy against another and against doing nothing. Because the purpose of regulation is often to save lives — or at least to reduce risks to life — the benefits of many potential policies cannot be quantified without setting a value on human life. (Although non-fatal harms are also prevented through regulation of environmental and workplace hazards, agencies often ignore these regulatory benefits during CBA, in part because quantifying such benefits is complicated.) For example, imagine a potential Department of Transportation regulation providing that any city receiving federal highway construction funds must employ a specified number of school crossing guards to prevent students from being struck by cars. The costs of the regulation could be estimated with some pretense of accuracy. How many crossing

guards do recipient cities employ today? How much would each additional guard's salary, fringe benefits, and overhead cost? Although some estimation will be necessary, a plausible number can be offered. For this exercise, assume extra crossing guards cost a total of \$100 million yearly. The benefits of extra guards, however, defy straightforward quantification. Even if the sole benefit is the prevention of fatal car accidents, the magnitude of the benefit remains unknowable — or at least not capable of being weighed against the \$100 million cost — unless the policymaker ascribes a monetary value to each life saved. If the extra guards would save 20 lives annually, then the value of the benefits exceeds the value of the costs only if each life saved is valued above \$5 million.

How much is it worth to save a schoolchild from being killed by a speeding car? At some level, the question is preposterous, unanswerable. But laws and executive orders requiring that CBA be performed demand a number. To calculate the value of a human life—sometimes called the “value of a statistical life,” or VSL — economists have attempted to determine how persons value the elimination of risks of death. For example, if a person would pay  $x$  dollars to avoid a one-in-a-hundred chance of instant death, then the person values his own life at 100-times- $x$  dollars. To determine a person's “willingness to pay” to avoid a risk, one can simply ask (i.e., collect survey data), or one can extrapolate willingness to pay based on real-world phenomena, such as wage premiums for dangerous jobs. If two jobs are otherwise identical

but one presents a one-in-a-thousand risk of death each year for every worker, then employees at the dangerous job should demand higher compensation. An annual wage premium of \$8,000 would imply that workers are willing to accept the risk in exchange for that amount (or that workers at the safe job are willing to pay \$8,000 to avoid the risk), leading to a statistical life valued at \$8 million.

With a VSL of \$8 million, an agency dedicated to workplace safety could evaluate a proposed regulation. (Recent subjects of federal analysis include “General Working Conditions in Shipyard Employment,” “Flightcrew Member Duty and Rest Requirements,” and “Proximity Detection Systems for Continuous Mining Machines in Underground Coal Mines.”) Imagine that a new machine, if installed at an especially dangerous workplace, would reduce fatal accidents, saving five lives every year. Under a basic CBA, federal regulators would mandate installation of the machine if it costs less than \$40 million (that is, five saved workers multiplied by the \$8 million VSL). A machine priced at \$41 million would not be “cost beneficial,” and a competitor priced at \$39 million would be. The same principles apply when agencies consider proposals about shipyard conditions, flightcrew schedules, and mining equipment. At least, that is the basic idea.

The actual process, however, is more complicated. In addition to calculating the values of costs and benefits, regulators must consider when costs will be borne and when benefits will be enjoyed. A benefit reaped today is normally worth more than the same benefit tomorrow, and a cost incurred today normally hurts more than the prospect of an identical future cost. Because many regulations impose up-front costs to achieve future benefits, a CBA incorporates the “present value” of future benefits.

**C**ontroversy results from the combination of these two practices — the valuation of statistical lives and the discounting of future benefits. The problem is that while a dollar available today is worth more than a dollar provided in the future, it is far less clear that a life saved today is more valuable than a life saved a few years from now. If one regulation can deliver  $x$  dollars immediately and another regulation costing the same amount would take 10 years to deliver the same dollar amount, then the first regulation wins any CBA contest. But if one regulation saves a schoolchild today, and another regulation costing the

same amount would save a schoolchild 10 years from now, which regulation should be enacted? Right or wrong, the consensus among policymakers is that the life saved today is indeed worth more than the one saved in the future, and CBA practices generally discount future VSLs just as they discount future economic benefits.

To see the potential power of discounting, let us return to the \$39 million machine. If we imagine that the machine would save one life annually for five years — after which it would need replacement — the CBA initially seems to favor requiring the device. The benefits are \$40 million, saving five workers’ lives at \$8 million each, which exceeds the cost by \$1 million. But the entire cost of the machine is borne today, whereas the benefits (saved lives) will be realized only in the future. After the saved lives are discounted to present value, the machine is no longer cost-beneficial at \$39 million. Future workers are worth less than current ones, and the further into the future lives are saved by a regulation, the less valuable those lives appear to agencies considering regulations today.

Explicit discounting of future saved lives appears in the regulatory impact analyses accompanying all sorts of rules proposed every year. To choose but one example, let us consider a 2010 rule concerning food labeling enacted by the Food Safety and Inspection Service of the Department of Agriculture. The rule requires labels disclosing the percentage of fat in certain meat products, including ground hamburger meat, where such labeling was previously voluntary. The rule is expected to cost meat producers and retailers hundreds of millions of dollars. The projected benefits would appear in the form of improved health enjoyed by meat consumers caused by greater access to nutritional information. The agency estimated that after the labeling rules have been in force for several years, the regulation will save about 114.5 lives annually. Accordingly, like so many regulations, the meat-labeling rule will have up-front costs and distant benefits, making the discount rate an important part of the CBA. The higher the discount rate, the lower the present value of the benefits, and the less likely such a regulation will be enacted.

The value of a statistical life chosen by the agency will also significantly affect the result, with a higher VSL leading to higher benefit numbers. Here, the agency calculated a range of expected benefits, using VSLs from \$5 million to \$6.5 million and discount rates of 3 percent and 7 percent (commonly used rates). The vastly different outcomes starkly illustrate

the importance of the discount rate and VSL chosen by the agency. With a VSL of \$6.5 million and a discount rate of 3 percent, the total benefits are estimated to equal \$5.9 billion. With a VSL of \$5 million and a discount rate of 7 percent, the total benefits are estimated to equal \$1.1 billion. In other words, with no changes in assumptions concerning the effectiveness of food labeling in changing consumption habits, the relationship between meat consumption and fatal diseases, or the likelihood that industry will obey new regulations, the estimated benefits can nonetheless increase more than five-fold (or, from the other perspective, decrease by more than 80 percent) depending on procedural choices made by an agency during the CBA process.

This regulatory impact analysis also illustrates another reason that discounting of human lives plays such an important role when regulations are under review. Even though the agency believed that its proposed meat-labeling rule would have benefits in addition to saving human lives, those benefits were ignored when the agency quantified the rule's estimated monetary benefits. As a result, for purposes of the CBA, the value of preventing a nonfatal cancer was zero. Similarly, in the regulatory impact analysis justifying a recent OSHA regulation aimed at preventing crane accidents, "the agency did not estimate cost savings from avoiding crane accidents, but only estimated monetized benefits for avoiding fatalities . . . or injuries." The focus on saved lives is quite common, making it especially important that lives be valued correctly.

**E**ven if all moral objections are tabled, the current practice of discounting future human life cannot be justified even on a purely economic basis. Within the current CBA discounting regime, the discount rate for future lives should be radically reduced for two reasons, our two arguments. First, the inflation of health care costs, which are increasing far faster than the price of other goods and services, indicates that future generations will exhibit far greater willingness to pay to avoid fatal risks than economists measure today. Second, modern industrialized societies tend to increase in wealth, meaning that even if health care does not increase as a portion of the U.S. gross domestic product, future generations of Americans will be richer than Americans are today, meaning they will have more money to spend avoiding risk — their lives will be worth more. Combined, these phenomena cause undervaluation of future human

lives — leading to underestimation of the benefits of environmental and other regulation, resulting in needless deaths.

In recent years, rapid health care cost inflation has captured the attention of American politicians and scholars. CBA calculations, however, have not considered health inflation when calculating the value of future lives. Ignoring health inflation undervalues future lives no matter what discount rate is applied to future benefits. Accordingly, regardless of whether agencies should use 3 percent, 7 percent, or some other number — or even if they should use no discount rate at all, that is, a rate of 0 percent — underestimating the future value of a life saved will cause a CBA calculation to lowball the present value of that future benefit.

From 1960 to 2006, health care costs tripled as a portion of the U.S. gross domestic product, rising from 5.2 percent to 16 percent of GDP. Since 1980, health inflation has outpaced general inflation on average by more than 3 percent annually. With Americans devoting a greater percentage of their income to health care, it would appear that their willingness to pay to avoid death is rising. In other words, even in inflation-adjusted dollars, a future American will likely exhibit a willingness to pay more money to preserve his health (by, for example, avoiding a risk of death caused by exposure to workplace contaminants) than Americans do today. Assuming for the moment that health inflation will continue to outpace general inflation by 3 percent annually over the coming decade, then someone's willingness to pay in 2022 can be calculated as follows:

$$WTP_{2022} = WTP_{2012} \cdot 1.03^{10} = WTP_{2012} \cdot 1.34$$

Accounting for health inflation increases the value of a 2022 life by more than a third. Substituting a 20-year time period increases the value of a 2032 life by 81 percent. The resulting future value could then be discounted to determine its present value. Note, however, that the closer the discount rate is to the excess health inflation rate, the closer the "real discount rate" for future lives comes to zero. For example, if the appropriate discount rate for future benefits is 3 percent per year and health inflation also equals 3 percent per year, then the present value of a human life, regardless of when in the future that life is saved, becomes equal to the value of a life saved today. Of course, one could quibble about the precise numbers selected, but the point is clear. As long as health care costs are expected to rise at a rate above general infla-



tion — and an increasing share of GDP devoted to health care seems widely expected, if not universally applauded — then current CBA calculations undervalue future lives at least somewhat.

Current CBA discounting often further undervalues future lives because discounters regularly ignore rising per capita wealth (or, to be more precise, rising real — that is, inflation-adjusted — per capita income) in developed countries. Because the willingness to pay for safety is at least somewhat correlated with wealth, richer countries should use higher VSLs when assessing policies. Yet, when valuing the lives of persons saved in the future, many CBA calculators do not account for the growth of GDP in excess of inflation and population growth. (Some agencies — such as EPA and the Department of Transportation — have recently begun accounting for rising real income, but most agencies have not done so.) Developed countries, such as the United States, see increases in real GDP (that is, GDP adjusted for inflation) nearly every year. Although part of increased GDP results from population growth, the United States has enjoyed rising real GDP per capita for decades, with an annual increase of about 1.8 percent. Accordingly, the economic output of each American rises over time, even in inflation-adjusted dollars. Gains in output are divided among business profits, employee wages, and taxation, meaning that almost every year, the average American sees a real increase in the total money coming from profits (if, for example, he or she owns shares in for-profit companies), pay, and government outlays.

Any calculation of a VSL that incorporates willingness to pay for safety or willingness to accept risk will tend to place greater value on persons with more disposable money. The reason is simple: Willingness to pay for goods increases when one has money in the first place (or at least has access to credit). Only someone with money can exhibit willingness to part with it. Conversely, the toleration of harms — such as dirty air or dangerous working conditions that a government agency might regulate — in exchange for money increases with poverty.

A simple example illustrates the principle. If we assume an annual increase in real per capita GDP of 1.8 percent, then for every \$1,000 produced by each person in the United States today, each American in 10 years will produce \$1,195. When the increased output returns to the economy in profits, wages, and government outlays, Americans will have that much more real wealth to spend. All things being equal, someone in 2022 would pay \$1,195 to avoid a risk that someone would pay \$1,000 to avoid today. The

“wealth-adjusted” value of a 2022 benefit is therefore 19.5 percent greater than the same benefit today, at least before discounting.

Next, one can apply discounting to these figures. If one ignores increased future wealth and then imagines a future harm of the kind Americans today would pay \$1,000 to ameliorate, the present value of removing the future harm in 2022 is equal to

$$\text{Future Benefit} / (1 + \text{Discount Rate})^{\text{Years}}$$

which, with a discount rate of 7 percent and a period of 10 years equals

$$\$1000 / (1 + 0.07)^{10} = \$508$$

If the future benefit is valued at \$1,195 instead of \$1,000 — that is, if the benefit calculation accounts for the increased wealth of future Americans — then the value of removing the future harm in 2022 (using the same discount rate of 7 percent) is equal to

$$\$1,195 / (1 + 0.07)^{10} = \$607$$

The failure to use income-adjusted willingness to pay to avoid risk (and “willingness to accept” risk) figures when calculating the future benefits of health and safety regulations thereby leads to an undervaluation of about 16 percent for benefits obtained in 2022. For benefits accruing in 20 years, the undervaluation is about 30 percent.

In addition, future Americans will likely devote at least part of their extra income directly to risk reduction. One cannot predict with certainty what wealthier Americans will do with their additional real dollars. Absent good evidence that no extra cash will cover safety costs, however, CBA calculators cannot justify their inattention to future purchasing power. Especially as the quality of safety technology improves — which seems nearly certain to occur, at least for those who can afford it — it would be bizarre for Americans enjoying unprecedented wealth to skimp on their own safety.

When one combines the effects of health inflation and income-adjusted future willingness to pay, the undervaluation of future benefits in current CBA practice becomes especially stark. Using the 3 percent figure from above for excess health inflation (that is, the rate at which health care costs increase above general inflation) and 1.8 percent for increased real GDP per capita, the future value of a benefit can be calculated as follows: The future value of a benefit equals the value



# Mend It or End It

Americans would assign to the same benefit available today, multiplied each year by both 1.03 and 1.018. The numbers combine for an annual increase of about 4.85 percent.

Unless CBA calculators can justify their failure to account for health inflation and increasing per capita real GDP, they should immediately begin increasing the estimated value of future health and safety benefits. While controversy would remain as to what discount rate is appropriate when determining the present value of such future benefits, a CBA that correctly values future benefits will find more accurate present values for any correctly chosen discount rate, and current practice arbitrarily reduces the values of future benefits.

The two simple corrections to CBA calculations proposed here would immensely increase the projected monetized benefits of regulations expected to save lives in the future. By accounting for health inflation and rising real income, policymakers can more easily justify regulations concerning workplace safety, clean air, clean water, and highway safety, to name just a few. In particular, the long-term benefits of ameliorating global warming would have substantially greater monetary value if properly calculated. Because many global warming regulations are the responsibility of EPA, the agency's decision to incorporate rising real per capita income into its CBA is an important step in the right direction. Without silencing their ethical and moral critiques of discounting future human lives, those opposed to the practice should demand that if CBA calculations will incorporate such discounting, they must at least begin with a proper assessment of the future value to be discounted, a value one can accurately find only with a consideration of health care cost inflation and rising real per capita income. •

Professor Trachtenberg joins recent commentators such as Richard Revesz and Michael Livermore in arguing that, when it comes to regulatory cost-benefit analysis, we should mend it, not end it. In his view, future regulatory benefits should be reduced to present value at a lower rate than current practice, given evidence that health care costs rise at a higher rate than other goods and services and that individuals exhibit a higher willingness to invest in health and safety as their incomes rise.

The latter income elasticity point is a significant one and represents a forward-looking version of an argument offered by Lisa Heinzerling and Frank Ackerman in their paper "If It Exists, It's Getting Bigger: Revising the Value of a Statistical Life."

At the time they were writing, the standard VSL measure used by federal agencies not only failed to adjust for greater potential spending power in the future, it also failed to account for income increases we had already experienced. Many key VSL studies rely on market evidence that is over two decades old. If we seriously believe that such studies reveal people's preferences for investing in risk reduction, then we should be serious about the methodology and adjust it for inflation and income elasticity, as EPA has begun doing under the current administration. The next step for federal agencies should be to follow Professor Trachtenberg's recommendation and adjust for anticipated wage growth into the future as well.

The former recommendation gives more pause, as it could be seen as an opportunistic use of CBA's weaknesses, rather than a

strengthening of the methodology. Professor Trachtenberg infers that health care inflation represents rising consumer demand, rather than rent-taking, administrative inefficiency, moral hazard, and other market failures that contribute to the spectacular rise in U.S. health care expenditures. CBA practitioners do often estimate the value of regulatory benefits by looking to actual market behavior. But the health care market seems like an especially hazardous place to deploy that approach. After all, Professor Trachtenberg's health inflation formula implies that at some point in the future America's health care expenditures will approach one hundred percent of GDP.

Obviously, something is wrong with the way we are divining people's preferences. Strategically, Professor Trachtenberg's example serves to justify reducing the amount by which future health benefits are discounted.

Analytically, the example serves to reveal how fragile the CBA edifice really is.

Advocates can — and should — continue to press for preferred policy results using the dominant language of CBA. In that sense, we applaud Professor Trachtenberg's efforts to make CBA practice more consistent with its own intellectual premises. But whatever incremental gain is attained will simultaneously underscore the chief problem of reliance on CBA: each effort to tweak the process, to offer a more balanced analysis, shows how manipulable the methodology remains.

**Doug Kysar** is Deputy Dean and Joseph M. Field '55 Professor at Yale Law School. This view was co-authored by **Josh Galperin**, Associate Director of the Yale Center for Environmental Law & Policy.



**Doug Kysar**